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Long-toed Salamander (*Ambystoma macrodactylum*) Conservation in the Alberta Foothills: 2002 Field Summary Report

Alberta Species at Risk Report No. 73

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

Long-toed Salamander (*Ambystoma macrodactylum*) Conservation in the Alberta Foothills: 2002 Field Summary Report

Lisa Wilkinson
and
Stephen Hanus

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EXECUTIVE SUMMARY

This project continued inventory and monitoring efforts for long-toed salamanders in the Alberta foothills. A total of 154 ponds were surveyed, of which 56 had evidence of breeding salamanders. Long-toed salamander eggs were found in all but one known breeding pond in the Athabasca Valley area (surveyed 2000-2001), and in 78% of previously identified breeding ponds in Jasper National Park (surveyed 1995-1996). In the Bow Valley area, only 61% of known salamander breeding ponds (surveyed 1998-2001) continued to have evidence of breeding. Attempts to identify populations in new survey areas were unsuccessful with the exception of one observation in an ancillary survey south of the Peace River. Pitfall trapping results at two ponds provided data for long-term population monitoring, and mark-recapture was initiated in the Athabasca Valley. It appears that long-toed salamander populations may be stable in protected areas, but are isolated and vulnerable to habitat destruction in other parts of their range within Alberta. Continued monitoring, education, and conservation actions are recommended.

1.0 INTRODUCTION

Long-toed salamanders (*Ambystoma macrodactylum*) are found in the northwestern United States, British Columbia and Alberta. They are at the northern limit of their range in Alberta, where they are restricted to river valleys in the Rocky Mountain foothills (Russell and Bauer 2000), except for a small population which was recently discovered in the Peace River Valley area (Walsh 1998). Long-toed salamanders are listed as a species of "Special Concern" in Alberta, because they are found in isolated and disjunct populations and have a limited distribution (Alberta Sustainable Resource Development 2000). In addition, there is evidence that long-toed salamanders are sensitive to habitat alteration, fragmentation and destruction (Fukumoto 1995; Graham and Powell 1999; Naughton *et al.* 2000). While some populations are in protected areas, most are in areas of increasing industrial activity and human development.

Long-toed salamanders are small, cryptic, nocturnal, forest-dwelling salamanders that are rarely seen and difficult to study. Adults travel to ponds to breed in the spring, entering ponds before they are completely ice-free. In late summer, young-of-the-year disperse from ponds, although at high elevation sites larvae may overwinter (Russell and Bauer 2000). If populations are isolated and breeding ponds limited, alteration or destruction of an established breeding pond could have profound consequences on a population.

Alberta initiated a provincial amphibian monitoring program (RANA –Researching Amphibian Numbers in Alberta) in 1997. The program is designed to monitor long-term population data by conducting annual pond surveys in established study areas, including operating pitfall traps at one pond per study area. A secondary objective of the program is to provide public education regarding amphibians, while also promoting wetland ecology and conservation. In 2001, a long-toed salamander monitoring program was introduced at RANA sites with breeding populations of salamanders, placing emphasis on surveying ponds known to contain breeding salamander populations as well as surveying new ponds for presence of salamanders.

In 2002, the long-toed salamander program was expanded in three regards. First, breeding sites identified in 1995 and 1996 benchmark surveys in the Rocky Mountain corridor (Oseen *et al.*1995; Hamilton *et al.*1996) were revisited to investigate persistence of populations. Second, surveying was expanded into new areas to identify range expansions and new populations that may link currently known isolated populations. We have limited understanding of historic population movements, and more importantly, we need to evaluate the degree of isolation and associated vulnerability to habitat destruction. Finally, mark-recapture was initiated at one pitfall trapping pond to gather more detailed population trend information.

2.0 STUDY AREA

The study area is in southwestern Alberta (Figure 1). The Athabasca Valley (Hinton area) and Bow Valley (Kananaskis Country area) RANA study areas are located in the foothills natural region (Alberta Environmental Protection 1994). Additional pond surveys were conducted in and around Jasper and Banff National Parks, which are located in the rocky mountain natural region (Alberta Environmental Protection 1994). A brief survey was conducted in the Silver Valley area (ecological reserve), south of Peace River.

Figure 1. Long-toed salamander study areas in Alberta 2002.

3.0 METHODS

Methods outlined in the provincial long-toed salamander surveying and monitoring protocol were followed (Pretzlaw *et al.* 2002). Surveys were primarily designed to identify and track the presence of breeding salamander populations over time.

Searching for eggs was the primary inventory method, because long-toed salamander eggs are easy to discern from other amphibian eggs and are usually visible since they are laid in shallow water near the shoreline. Surveys were conducted in spring coinciding with ice thaw. Wherever possible, two surveys were conducted per pond to determine the maximum number of eggs laid and to track timing of reproduction.

Pitfall traps were operated at one pond in each of the Athabasca Valley (Wellsite Pond) and Bow Valley (Kuhn's Pond) RANA sites. Pitfall traps were operated for approximately six weeks in spring and six to eight weeks in late summer. Traps were constructed of two 6-inch plastic flower pots taped end to end, with the top removed. Traps were dug into the ground, flush with the ground surface and placed 10m apart on both sides of silt fencing encircling the pond. Each trap contained a rock to act as a perch, a wet sponge to maintain moisture, and a stick to allow small mammals to escape. A coroplast trap cover elevated above each trap by nails provided shade and prevented rainfall accumulation. Traps were checked every day or every other day. All captured amphibians were identified to species, weighed, measured (snout to vent), sexed, and released on the opposite side of the fence from which they were captured. Salamanders captured at the Wellsite Pond were marked with elastomer at the base of the tail (refer to Northwest Marine Technology 2000 and Pretzlaw et al. 2002 for details). Between trapping periods, traps were closed and sections of the fence were removed to allow passage to and from the pond.

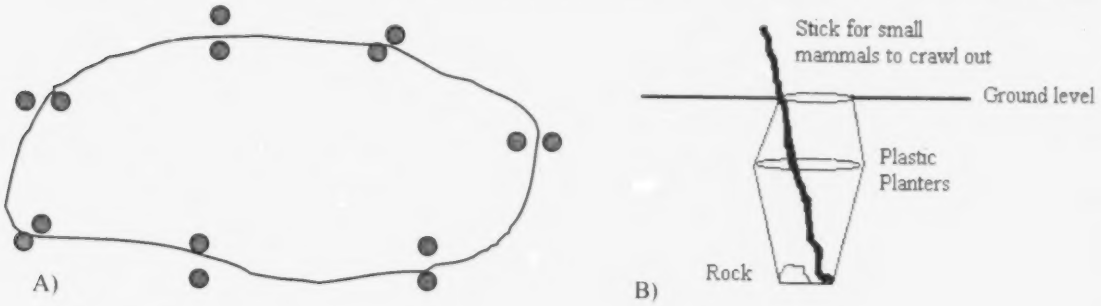

Figure 2. Layout of fencing and pitfall traps (A), and close-up of the pitfall trap design (B).

In the Peace River area, minnow traps were used to capture larvae and adults in mid-late summer because ponds were too cloudy to conduct egg searches (refer to Pretzlaw et al. 2002 for details).

4.0 RESULTS

The following results summarize long-toed salamander data collected in 2002. Further study details from 2002, including information on other amphibian species, can be found in Hanus (2003) and Rose (2002). A summary of other amphibian species observed is provided in Appendix 1.

4.1 Trapping Data

At the Wellsite Pond (Table 1), 114 long-toed salamander adults were captured in spring 2002, which was similar to the number captured in 2001 (102; Huynh 2001). In late summer 2002, 88 young-of-the-year were captured, which was more than in 2001 (59; Huynh 2001). The maximum egg count in 2002 was 3,625, also greater than in 2001 (1,400; Huynh 2001). All adults and young-of-the-year were marked with elastomer (Northwest Marine Technology 2000), with 2003 being the first year for recapture data collection. Two additional ponds were set up with drift fencing and pitfall traps and may be operated in 2003. All new long-toed salamanders captured at each trapping site will be marked with elastomer.

This was the first year Kuhn's Pond was operated as an amphibian trapping site. The previous trapping pond had dried up for three consecutive years and was deemed unsuitable, and consequently, comparisons to previous capture data are not possible. A total of 125 adults and 345 young-of-the-year long-toed salamanders were captured in 2002 (Table 2).

Table 1. Number of long-toed salamanders captured at Wellsite Pond, Hinton, 2002.

	Long-Toed Salamander Captures – Wellsite Pond 2002			
	# Adults	**# Adults/Trap night**	**# YOY***	**# YOY/Trapnight**
Spring	114	0.15	N/A	N/A
Late Summer	16	0.02	88	0.10
Total	*130*	*N/A*	*88*	*N/A*

*YOY = young-of-the-year

Table 2. Number of long-toed salamanders captured at Kuhn's Pond, Canmore, 2002

	Long-Toed Salamander Captures – Kuhn's Pond 2002			
	# Adults	**# Adults/Trapnight**	**# YOY***	**# YOY/Trapnight**
Spring	93	0.22	N/A	N/A
Late Summer	27	0.03	345	0.37
Total	*120*	*N/A*	*345*	*N/A*

*YOY = young-of-the-year

Six ponds were surveyed in the in the Silver Valley area, and one larval long-toed salamander was found (Pollock 2002).

A summary of the morphometric data collected is provided in Appendix 2, all of which fell within normal parameters. Deformities were observed, but appeared to be as a result of injury (*i.e.* inter- and intra-species predation) and not genetic malformation.

4.2 Shoreline Surveys

Although all salamander observations were recorded, only breeding observations were considered when calculating persistence of populations in historic ponds (*i.e.* previously identified breeding ponds). The Hinton RANA area has been surveyed since 2000. All known breeding ponds had evidence of long-toed salamanders in 2002 with only one exception (94%; Table 3). New ponds south (south of the McLeod River) and north (Grande Cache) of Hinton were surveyed but failed to produce new salamander observations (Table 3). In Jasper National Park, 78% of previously identified breeding ponds had evidence of salamanders in 2002 (Table 3). Also in Jasper, six additional ponds for which anecdotal salamander records existed were surveyed. Two of these ponds had evidence of breeding. Seven new breeding ponds were found in both Hinton and Jasper areas (Table 3).

The Kananaskis RANA area has been surveyed since 1998. Although four new breeding ponds were found, only 61% of known breeding ponds had evidence of long-toed salamanders in 2002 (Table 3). Park staff from Banff National Park periodically inventory ponds and have records of a number of persistent salamander breeding ponds; only five ponds were included in this survey.. Surveys were expanded north of the Bow Valley and east of Banff, but no salamanders were found (Table 3).

Table 3. Summary of shoreline surveys and long-toed salamander observations in the Alberta foothills, 2002.

Location	Total # of Ponds Surveyed	Total # of Ponds with LTSA Observations	# of New Ponds with LTSA Observations	# of Known* Breeding Ponds with LTSA Observations (# of known LTSA ponds surveyed)	% of Ponds with Persistent LTSA Populations**
Hinton	30	22	7	15 (16)	93.75
South of McLeod River	7	0	0	N/A	N/A
Grande Cache	4	0	0	N/A	N/A
Jasper	26	16	7	7 (9)	77.78
Kananaskis	71	15	4	11 (18)	61.11
Banff	5	3	0	N/A	N/A
East of Banff	11	0	0	N/A	N/A
Total	*154*	*56*	*18*	*32 (43)*	*N/A*

* Ponds with previous observations of breeding long-toed salamanders.

** Persistence refers to ponds in which evidence of breeding salamanders were observed in 2002 in addition to a previous year.

4.3 Education

Public education continued to be an important component of the project. Park interpretative programs, public displays, and school talks reached over 3000 people. In addition, this project promoted the Alberta Amphibian Volunteer Monitoring program, which encourages people to submit amphibian observations to the provincial database.

5.0 DISCUSSION

Pitfall trapping is useful for gathering local population size and trend information, as well as gathering data on morphometrics, demographics, and general health. Introducing mark-recapture will improve our understanding of population size and trends, and provide data on pond fidelity and dispersal. These latter data are particularly important for management in terms of identifying the importance of existing ponds and surrounding habitat to salamander persistence.

Shoreline surveys are extremely important to monitor the persistence of long-toed salamanders. Based on resurvey efforts in Jasper National Park, it appears that salamander populations within the park are persistent and likely stable. These populations were identified in 1995 and/or 1996 (Oseen *et al.*1995; Hamilton *et al.* 1996). Breeding ponds and surrounding habitat are protected from alteration and destruction by industrial activities. However, park visitors can degrade shorelines and destroy amphibian eggs through trampling and dog walking/swimming in breeding ponds (amphibian numbers have reduced significantly in a Canmore pond since the adjacent area has been established as a dog off-leash area; S. Rose, pers. comm). Tourist development and fish stocking can also impact salamander breeding ponds.

Most known breeding ponds in the Athabasca River Valley continued to show evidence of salamanders, although these ponds have only been monitored for three or less years. The discovery of additional breeding ponds is encouraging. The Bow River Valley ponds have been monitored for up to five years, and persistence is only 61%. While it is important to consider that evidence of salamanders may have been missed, or that salamanders may be using different breeding ponds, it could be indicative of an overall decline. The Bow Valley corridor is under tremendous pressure from recreation and development, and anecdotal observations from around the town of Canmore supports this supposition (S. Rose, pers. comm.). The Athabasca Valley area is under pressure from industrial development, including oil and gas exploration, forestry, and mining. These activities have the potential to alter and destroy critical wetland habitat, and thus habitat protection and monitoring are critical.

We attempted to survey ponds beyond the current known range of long-toed salamanders in the foothills, expanding east and north. Unfortunately, poor weather conditions limited this component of the project. The small population east of the foothills around the Peace River Valley (Walsh, 1998) warrants further inventory to determine distribution and identify potential habitat risks. The observation of a salamander larva in 2002 was the first time the species has been documented south of the Peace River, previous records are from the Fairview area north of the river. While further survey efforts are recommended, results from this and other provincial studies support the observation that long-toed salamander range is limited, and most breeding

populations appear to exist in isolated and disconnected areas. This heightens the risk to the species within the northern Rocky Mountain foothills; it is unlikely that source populations can replenish breeding populations that are lost due to habitat destruction and increasing isolation.

While current monitoring efforts are beginning to define pond characteristics that are suitable for breeding (*i.e.* small, shallow, fishless, and permanent), we have limited understanding of forest habitat requirements beyond the need for cover and moisture; mature forests typically surround breeding ponds in the foothills. Given that long-toed salamanders spend the majority of their lives in forests, management considerations need to encompass terrestrial habitat as well as breeding ponds. A study in Montana found that clear-cutting negatively impacted local salamander populations (Naughton *et al.* 2000). Future research should determine how far salamanders travel to reach breeding ponds, how far young-of-the-year disperse, and assess pond fidelity. This information would help to ensure appropriate habitat conservation, as well as understand the extent to which populations are isolated. Currently, buffer strips of 100-200m have been established around known breeding ponds on crown land to reduce industrial activity that may impact pond quality. However, it is unlikely that these buffers protect an adequate amount of forest habitat required during non-breeding, including hibernation. Improved policies regarding fish introduction, and wetland draining and contamination are required; however, there is no recourse to protect salamander ponds on private land.

Results of our study must be interpreted with caution because amphibian populations have inherent stochasticity and are strongly influenced by environmental conditions. This study represents the beginning of a long-term monitoring program. Continued education and communication with land-use managers is essential, in addition to long-term monitoring. An important consideration of this study is that protection of long-toed salamander habitat benefits a suite of wildlife species.

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7.0 APPENDICES

APPENDIX 1. Amphibian observations from shoreline surveys, 2002

Table 1. Summary of amphibians observed in pond surveys, Hinton area, AB, 2002.

Species*	Number of Ponds with Observations	Breeding Stage Observed
BCFR	*2*	*Eggs, Adults*
BOTO	*6*	*Eggs, Adults*
LTSA	*22*	*Eggs, Larvae, Young-of-Year, Adults*
WOFR	*31*	*Eggs, Larvae, Young-of-Year, Adults*

*boreal chorus frog (BCFR), boreal toad (BOTO), long-toed salamander (LTSA), wood frog (WOFR).

Table 2. Summary of amphibians observed in pond surveys, Jasper area, AB, 2002.

Species*	Number of Ponds with Observations	Breeding Stage Observed
BOTO	*3*	*Eggs, Adults, Larvae*
CSFR	*2*	*Adults, Larvae*
LTSA	*16*	*Eggs*
WOFR	*6*	*Eggs, Larvae, Adults*

*boreal toad (BOTO), Columbia spotted frog (CSFR), long-toed salamander (LTSA), wood frog (WOFR).

Table 3. Summary of amphibians observed in pond surveys, Kananaskis area, AB, 2002.

Species*	Number of Ponds with Observations	Breeding Stage Observed
BCFR	*1*	*Adults*
BOTO	*14*	*Eggs, Larvae, Young-of-Year, Juveniles, Adults*
CSFR	*13*	*Eggs, Larvae, Adults*
LTSA	*15*	*Eggs, Larvae, Young-of-Year, Juveniles, Adults*
WOFR	*41*	*Eggs, Larvae, Young-of-Year, Juveniles, Adults*

*boreal chorus frog (BCFR), boreal toad (BOTO), Columbia spotted frog (CSFR), long-toed salamander (LTSA), wood frog (WOFR).

Table 4. Summary of amphibians observed in pond surveys, Banff area, AB, 2002.

Species*	Number of Ponds with Observations	Breeding Stage Observed
LTSA	*3*	*Larvae, Juveniles, Adults*
WOFR	*1*	*Larvae, Adults*

*long-toed salamander (LTSA), wood frog (WOFR).

Table 5. Summary of amphibians observed in pond surveys, East of Banff, AB, 2002.

Species*	Number of Ponds with Observations	Breeding Stage Observed
WOFR	*1*	*Eggs*

*wood frog (WOFR).

APPENDIX 2. Morphometric data from trapping ponds, 2002.

Table 1. Spring adult long-toed salamander captures and morphological characteristics from Alberta RANA sites in 2002.

RANA SITE	Total #	Sex			Snout-to-Vent Length (cm)		Mass (g)	
		Male	Female	Unknown	Mean	Range	Mean	Range
Wellsite Pond May 13-June 29 (767 trap nights)	**114**	41	73	0	6.5	5.0-8.1	5.4	2.6-9.5
Kuhn's Pond May 21-June 15 (416 trap nights)	**93**	51	41	1	6.4	5.3-7.8	5.1	3.0-9.0

Table 2. Late summer adult and young-of-the-year long-toed salamander captures and morphological characteristics from Alberta RANA sites in 2002.

RANA SITE	Age	Total #	Sex			Snout-to-Vent Length (cm)		Mass (g)	
			Male	Female	Unknown	Mean	Range	Mean	Range
Wellsite Pond Aug. 9 – Oct. 2 (879 trap nights)	**Adult**	**16**	6	6	4	5.6	3.4-7.7	4.2	2.0-10.4
	YOY	**88**	1	0	87	3.5	2.8-4.9	1.1	0.5-1.8
	Total	**104**	7	6	91	N/A	N/A	N/A	N/A
Kuhn's Pond Aug 17-Oct. 15 (944 trap nights)	**Adult**	**27**	0	0	27	4.6	3.5-6.5	3.1	2.0-6.5
	YOY	**345**	0	0	345	2.8	1.8-4.8	0.6	0.1-1.8
	Total	**372**	0	0	372	N/A	N/A	N/A	N/A

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